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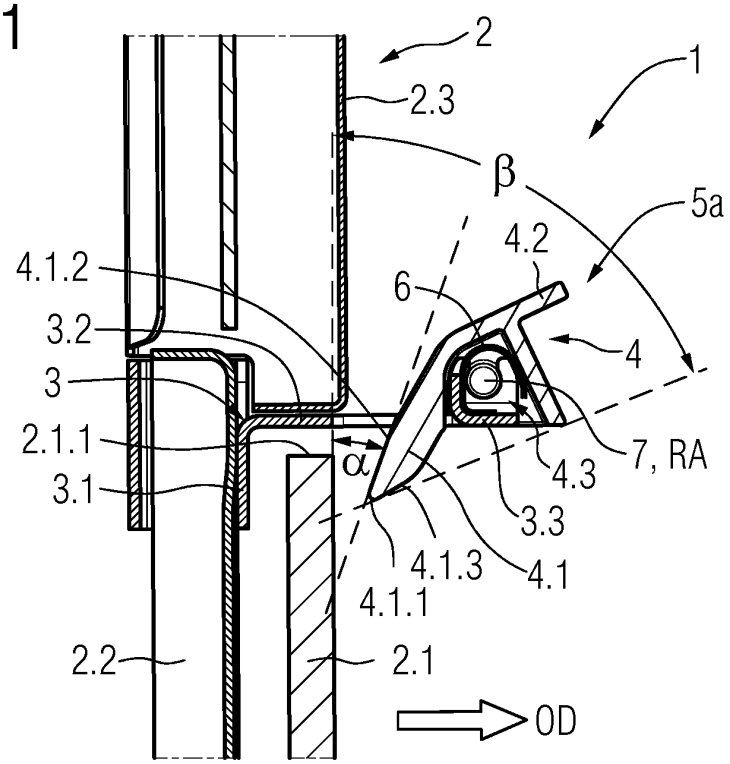
(54) **Lock system**

(57) The invention relates to a lock system for a door (2.1) of an oven (2) comprising a fastening element (3) mounted at the chassis of the oven (2) and a blocking element (4) with a blocking portion (4.1) pivotally mounted at the fastening element (3), wherein the blocking element (4) is adapted to be positioned in an activated tilting position (5a) in which the opening of the door (2.1) is prohibited by the blocking element (4) and a deactivated tilting position (5b) in which the opening of the door (2) is allowed by the blocking element (4), wherein at least in the activated tilting position (5a) the blocking portion (4.1) of the blocking element (4) is located with respect to the opening direction (OD) of the door (2.1) in front of the outer side of said door (2.1).

FIG 1



EP 2 851 492 A1

Description

Lock system

[0001] The present invention relates generally to the field of lock systems. More specifically, the present invention is related to a lock system for oven doors.

BACKGROUND OF THE INVENTION

[0002] Ovens for food preparation are well-known in prior art. Said ovens comprise an oven chassis forming an oven cavity with a cavity opening for receiving the food to be prepared. In addition, the oven comprises a door for closing the cavity opening. The oven door acts as thermal barrier to keep the heat energy in the cavity during operation of the oven. Typically, oven doors are at least partially transparent in order to enable the user to control the process of foot preparation within the closed cavity.

[0003] The oven door may be pivotally mounted to the oven cavity by means of hinges which allow a movement of the oven door relative to the oven cavity. Also drawer-like doors adapted to be pulled-out of the oven are available in the market.

[0004] Typical oven doors are manually operated. They comprise a handle for applying manual force to the door to be opened. In order to avoid an undesired opening of the oven door during operation of the oven, for example, by children leading to severe burns, lock systems are known in prior art.

[0005] Document DE 697 05 653 T2 discloses an oven door lock for an oven door. The oven door lock comprises a lever, accessible from the oven front which can be rotated about a spindle mounted on the oven chassis. A stop extending from the lever spindle to the inside of the oven has a free end. The stop rotates with the lever about the spindle. The lever is in the active position when the stop free end obstructs the passage of a strike plate, located on the door perimeter, during door opening. This prevents the door being opened. The inactive position is obtained by manual displacement of the lever towards the door handle so as to move the door away from the stop free end and free passage of the strike plate. The door can then be opened by pulling on the handle.

[0006] A drawback of the oven door lock is that a certain gap between the upper edge of the oven door and the control panel of the oven is needed to allow a fixing of the known oven door lock at existing typicalovens. Especially modern ovens only comprise a small gap between the oven door and the surrounding oven parts, e.g. the control panel which does not allow an integration of the known door lock system. In addition, door lock systems to be integrated in a small installation space have to be adjusted very accurately to obtain a sufficient locking performance. Due to the restricted installation space, the stop and the strike plate have to be flat, so the lock system may be overcome by applying a certain pulling force at the handle.

[0007] Accordingly, there is a need for improvements of existing lock systems in order to achieve a tolerance insensitive system which can be installed even at ovens providing low installation space.

SUMMARY OF THE INVENTION

[0008] It is an objective of embodiments of the invention to provide for an improved lock system for an oven and an oven with an improved lock system. The objective is solved by the features of the independent claims. Preferred embodiments are given in the dependent claims. If not explicitly indicated otherwise, embodiments of the invention can be freely combined with each other.

[0009] According to a first aspect of the invention, the invention relates to a lock system for a door of an oven comprising a fastening element mounted at the chassis of the oven and a blocking element with a blocking portion pivotally mounted at the fastening element, wherein the blocking element is adapted to be positioned in an activated tilting position in which the opening of the door is prohibited by the blocking element and a deactivated tilting position in which the opening of the door is allowed by the blocking element. In the activated tilting position the blocking portion of the blocking element is located with respect to the opening direction of the door in front of the outer side of said door. Thereby, an effective tolerance insensitive locking of the door with a high lock force is achieved which can be installed easily at existing ovens. In addition, by using upper-mentioned structure of the lock system, possible interference problems with structural parts of the oven and the oven door can be avoided.

[0010] The lock system may be adapted and placed at the oven such, that the opening of the door can only be achieved by using both hands simultaneously, namely a first hand for grabbing the handle of the oven door and the further hand for actuating the lock system.

[0011] According to preferred embodiments, the blocking element is pivotally arranged about a rotational axis and the rotational axis is arranged with respect to the opening direction of the door in front of the outer side of said door. Thus, also the pivot point of the lock system is located in front of the front side of the oven. Thereby the requirements regarding the installation place are very low.

[0012] According to preferred embodiments, the blocking element comprises a handle for manually actuating the blocking element. Said handle may be also located in front of the front side of the oven. Said handle may be located opposite to the blocking portion.

[0013] According to preferred embodiments, the blocking element is constituted by a one-piece-element comprising a handle portion and the blocking portion. The blocking element may be a plastic part manufactured by injection molding. Said injection molded element may further comprise a recess for receiving a spring for biasing

the blocking element into the activated tilting position. Using a one-piece element, especially an injection molded element is advantageous because the costs of the lock system are reduced significantly.

[0014] According to preferred embodiments, the blocking portion comprises a tapered free end. Preferably, said free end comprises a wedge-like shape with the wedge tip at the free end of the blocking portion. Thereby the free end of the blocking portion can be tilted upwardly form a slanted, downward orientated position in a horizontal or essential horizontal position and the door can pass through said blocking portion.

[0015] According to preferred embodiments, the free end of the blocking portion is constituted by a wedge-shaped portion comprising a first surface section facing the outer side of the door in the activated tilting position and a second surface section arranged on the side turned away from the outer side of the door in the activated tilting position, wherein the angle confined by the second surface section and the outer side of the door is greater than the angle confined by the first surface section and the outer side of the door.

[0016] According to preferred embodiments, the longitudinal direction of the blocking portion is slanted downwardly in the activated tilting position of the blocking element. In other words, the longitudinal direction of the blocking portion and the vertical direction, i.e. the plane in which the front side of the door is located confine an acute angle which opens upwardly. Said angle may be between 20° and 50°, for example 20°, 25°, 30°, 35°, 40°, 45° or 50° or any angle between 20° and 50°.

[0017] According to preferred embodiments, the free end of the blocking portion is constituted by a wedge-shaped portion comprising a first surface section facing the outer side of the door in the activated tilting position and a second surface section arranged on the side turned away from the outer side of the door in the activated tilting position, wherein the angle confined by the second surface section and the outer side of the door is between 45° and 85°, preferably between 50° and 70°, wherein the angle widens upwardly. The second surface section serves a sliding surface for the upper edge of the door, wherein the blocking portion is lifted up by a sliding of the door at the second surface section. The slanted orientation of the sliding surface leads to a low force necessary for lifting up the blocking portion, so the blocking portion can even be lifted up by an automatic soft close mechanism.

[0018] According to preferred embodiments, the free end of the blocking portion is constituted by a wedge-shaped portion comprising a first surface section facing the outer side of the door in the activated tilting position and a second surface section arranged on the side turned away from the outer side of the door in the activated tilting position, wherein the angle confined by the first surface section and the outer side of the door is between 0° and 40°, preferably between 10° and 30°, wherein the angle widens upwardly. Said arrangement is advantageous because of the slanted orientation of the blocking portion the lock is strengthened when pulling the door against the blocking element located in the activated tilting position.

[0019] According to preferred embodiments, the blocking element is preloaded to the activated tilting position by means of a spring. Said spring may, for example, be a compression or torsion spring. Thereby, the activated tilting position is automatically achieved by the blocking element and the blocking element is biased in said activated tilting position.

[0020] According to preferred embodiments, the spring force is dimensioned such that tilting of the blocking element by abutting of the door against the second surface section of the blocking portion and lifting up said blocking portion by means of the closing force of an automatic close mechanism of the door is possible. Thereby the automatic close mechanism is not interfered or prevented by the lock system.

[0021] According to preferred embodiments, the lock system is adapted such that the activated tilting position of the blocking element is reinforced when trying to open the door in the activated state of the lock system. This is specifically obtained by the slanted position of the blocking element downwardly in the activated tilting position. Thereby a very high lock force is obtained.

[0022] According to preferred embodiments, the fastening element comprises a bracket-like shape. Thereby it is possible to attach the fixing element in a space saving manner at ovens. Even the attachment of the lock system even at ovens with poor installation space capabilities is possible.

[0023] According to preferred embodiments, the fastening element comprises a first bracket leg and a second bracket leg wherein the first bracket leg is arranged at the chassis of the oven and the free end of the second bracket leg is located in front of the door with respect to the opening direction of the door. Thereby it is possible to place the blocking element in front of the oven door especially in front of the front glass of the oven door.

[0024] According to preferred embodiments, the blocking element may be adapted to be snapped onto the fastening element. Thereby the lock system can be manufactured with reduced effort.

[0025] According to preferred embodiments, the second bracket leg of the fastening element comprises a recess through which the blocking portion passes through. Thereby it is possible to place the handle and preferably the rotational axis above the fastening element, specifically above the second leg of the fastening element and at least in the activated tilting position, the blocking portion extends downwardly through the recess of the second bracket leg.

[0026] According to a second aspect, the invention refers to an oven for preparing food comprising an oven cavity with a cavity opening and at least one door adapted to cover the cavity opening, with a lock system for securing the closed state of the door, wherein the lock system

is adapted according to anyone of the preceding embodiments.

[0027] The term "essentially" or "approximately" as used in the invention means deviations from the exact value by +/- 10%, preferably by +/- 5% and/or deviations in the form of changes that are insignificant for the function.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] The various aspects of the invention, including its particular features and advantages, will be readily understood from the following detailed description and the accompanying drawings, in which:

Fig. 1 shows a schematic side view of a lock system in activated tilting position arranged at an oven;

Fig. 2 shows a schematic side view of the lock system in deactivated tilting position arranged at an oven;

Fig. 3 shows a schematic side view of the lock system according to Fig. 1 and 2 when closing the door;

Fig. 4 shows a perspective view of the lock system in activated tilting position arranged at an oven;

Fig. 5 shows a perspective view of the lock system in deactivated tilting position arranged at an oven; and

Fig. 6 shows a perspective view of the lock system when tilting back to the activated tilting position.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0029] The present invention will now be described more fully with reference to the accompanying drawings, in which example embodiments are shown. However, this invention should not be construed as limited to the embodiments set forth herein. Throughout the following description similar reference numerals have been used to denote similar elements, parts, items or features, when applicable.

[0030] Fig. 1 shows a lock system 1 arranged at an oven 2. The oven 2 comprises a door 2.1 pivotally mounted at the oven chassis 2.2 or a drawer-like door adapted to be pulled-out of the oven 2. The door 2.1 serves as a sealing element for an oven cavity. After the door 2.1 has been opened, the food to be prepared may be placed in the oven cavity and the door 2.1 is closed in order to obtain a sealed camber for the food preparing process.

[0031] In order to avoid an undesirable opening of the door 2.1, for example by children, a lock system 1 is arranged at the door 2.1 of the oven 2. The lock system 1 comprises a fastening element 3 and at least one blocking element 4. The fastening element 3 is adapted to attach the lock system 1 at the oven chassis 2.2. Said attachment may be realized by any fastening means, for example by means of screws, notchs or adhesive means.

[0032] According to the embodiment shown in fig. 1, the lock system 1 is arranged at the top side of the oven cavity 2.2. The fastening element 3 is preferably formed by a bracket-like element with the first bracket leg 3.1 parallel or essentially parallel to the plane in which the door 2.1 is situated. Said first bracket leg 3.1 may be used to anchor the lock system 1 to the oven 2 by uppermentioned fastening means. The fastening element 3 further comprises a second bracket leg 3.2 extending perpendicular or essentially perpendicular to the first bracket leg 3.1. The second bracket leg 3.2 partially extends through a gap formed between the upper edge 2.1.1 of the door 2.1 and the oven chassis 2.2, respectively, the control panel 2.3 of the oven 2. Alternatively, the fastening element 3 may be fixed laterally at the oven chassis 2.2, for example at the side wall of the oven 2.

[0033] The fastening element 3 further comprises a free end 3.3 at the second bracket leg 3.2 which is located with respect to the opening direction OD of the door 2.1 in front of said door 2.1. In other words, the fastening element 3 protrudes with its free end 3.3 beyond the plane in which the door 2 is located. In the area of the free end 3.3, a hinge point for pivotally mounting the blocking element 4 at the fastening element 3 is provided. According to the present embodiment, the blocking element 4 is pivotally mounted to the fastening element 3 by means of a bolt 7 building the rotational axis RA of the blocking element 4. Said rotational axis RA may be a horizontal axis running parallel and horizontally spaced to the plane in which the door 2.1 is located.

[0034] The blocking element 4 may be formed by a one-piece element comprising a handle portion 4.2 for manually actuating the blocking element 4 and a blocking portion 4.1 which ensures the blocking of the oven door 2.1 in the activated state of the lock system 1. The blocking element 4 is adapted such that a user is able to pivot the blocking element 4 by a given angle, namely from an activated tilting position 5a (shown in fig. 1) to a deactivated tilting position 5b shown in fig. 2. The lock system 1 may comprise a spring 6. The blocking element 4 may comprise a recess 4.3 for receiving the spring 6. Said spring 6 may be adapted to bias the blocking element 4 towards the activated tilting position 5a by means of its spring force. Preferably, there are mechanical stops for limiting the tilting of the blocking element 4 and in the activated tilting position 5a, the blocking element 4 rests against one of said mechanical stops. Preferably, the spring 6 may be a compression or torsion spring.

[0035] The blocking portion 4.1 of the blocking element 4 may be arranged with respect to the fastening element 3 such that in the activated tilting position 5a of the lock system 1 the free end 4.1.1 of the blocking portion 4.1 forms a mechanical stop for the door 2.1 to be opened. When opening the door 2.1 a portion of the outer surface

of the door 2.1 may rest against the free end 4.1.1 of the blocking portion 4.1. Thereby, the further opening of the door 2.1 is prevented because a further tilting of the blocking element 4 is prevented by said mechanical stop.

[0036] By actuating the blocking element 4 by means of the handle 4.2, the whole blocking element 4 may be tilted in the deactivated tilting position 5b thereby lifting the free end 4.1.1 of the blocking portion 4.1 up in order to unblock the door 2.1 (fig. 2). Thereby the lock system 1 is deactivated and the door 2.1 may get opened.

[0037] Preferably, the free end 4.1.1 of the blocking portion 4.1 is tapered, wherein the thickness of the blocking portion 4.1 decreases towards the free end 4.1.1. In other words, the blocking portion 4.1 is a wedge-shaped portion with a wedge tip at the free end 4.1.1. The wedge tip may be a pointed end or a rounded end.

[0038] The blocking portion 4.1 may comprise a first surface section 4.1.2 which faces the outer side of the door 2.1. The door 2.1 may at least partially rest against said first surface section 4.1.2 when getting opened in the activated state of the lock system 1. Preferably, in the activated tilting position of the blocking element 4, the first surface section 4.1.2 may be inclined with respect to a vertical plane in which the outer side of the door 2.1 is located. The angle α confined by the first surface section 4.1.2 and the outer side of the door 2.1 may be between 0° and 40°, preferably between 10° and 30°. The angle α may be 0°, 5°, 10°, 15°, 20°, 25°, 30°, 35° or 40° or any angle between 0° and 40°.

[0039] Furthermore, the blocking portion 4.1 may comprise a second surface section 4.1.3 which is located opposite to the first surface section 4.1.2. In other words, the second surface section 4.1.3 is located at the far side of the outer side of the door 2.1. In the activated tilting position 5a of the blocking element 4, the second surface section 4.1.3 may be inclined by an angle β with respect to a vertical plane in which the outer side of the door 2.1 is located. Said angle β may also widen upwardly and may be greater than α ($\beta > \alpha$). The angle β confined by the second surface section 4.1.3 and the outer side of the door 2.1 may be between 45° and 80°, preferably between 50° and 70°. The angle β may be 45°, 50°, 55°, 60°, 65°, 70°, 75° or 80° or any angle between 45° and 80°.

[0040] The slanting of the second surface section 4.1.3 is advantageous because, as shown in fig. 3, lifting up of the blocking portion 4.1 by tilting the blocking element is facilitated essentially. When the door 2.1 is opened, the blocking element 4 may return to the activated tilting position 5a wherein the blocking portion 4.1 is located within the movement space of the door 2.1. In order to enable a closing of the door with low physical effort or by means of an automatic soft-close mechanism of the door 2.1, the slanted second surface section 4.1.3 forms a sliding surface for the upper edge of the door 2.1. In other words, the upper edge of the door 2.1 slides along the second surface section 4.1.3 leading to a lift-up of the blocking portion 4.1 by tilting the blocking element 4 around the rotational axis RA. Thereby, the mechanical force for closing the door 2.1 can be lowered. By using said design, the door 2.1 will not be stopped even by an automatic soft close function with a low closing speed, respectively, a low closing force.

[0041] Preferably, the second bracket leg 3.2 of the fastening element 3 comprises a recess through which the blocking portion 4.1 passes through. The fastening element 3 may be formed by a sheet-like, flat material. Said material may be any kind of metal preferably stainless steel. Said fastening element 3 may be formed by punching and bending out of a sheet of metal.

[0042] Furthermore, the fastening element 3 may comprise a portion for receiving the blocking element 4. Said means may be formed by a pair of straps with at least one hole per each strap for receiving the bolt 7. The blocking element 4 may than be snapped onto said bolt.

[0043] Above, embodiments of the lock system according to the present invention as defined in the appended claims have been described. These should be seen as merely non-limiting examples. As understood by a skilled person, many modifications and alternative embodiments are possible within the scope of the invention.

List of reference numerals

[0044]

1	lock system
2	oven
2.1	door
2.1.1	upper edge
2.2	oven chassis
2.3	control panel
3	fastening element
3.1	first bracket leg
3.2	second bracket leg
3.3	free end
4	blocking element
4.1	blocking portion
4.1.1	free end
4.1.2	first surface section
4.1.3	second surface section
4.2	handle portion
4.3	recess
5a	activated tilting position
5b	deactivated tilting position
6	spring
7	bolt
α	angle
β	angle
OD	opening direction
RA	rotational axis

Claims

1. Lock system for a door (2.1) of an oven (2) compris-

ing a fastening element (3) mounted at the chassis of the oven (2) and a blocking element (4) with a blocking portion (4.1) pivotally mounted at the fastening element (3), wherein the blocking element (4) is adapted to be positioned in a activated tilting position (5a) in which the opening of the door (2.1) is prohibited by the blocking element (4) and a deactivated tilting position (5b) in which the opening of the door (2) is allowed by the blocking element (4), **characterised in that**, at least in the activated tilting position (5a) the blocking portion (4.1) of the blocking element (4) is located with respect to the opening direction (OD) of the door (2.1) in front of the outer side of said door (2.1).

2. Lock system according to claim 1, wherein the blocking element (4) is pivotally arranged about a rotational axis (RA) and the rotational axis (RA) is arranged with respect to the opening direction of the door in front of the outer side of said door (2.1).

3. Lock system according to claim 1 or 2, wherein the blocking element (4) comprises a means, in particular a handle (4.2), for manually actuating the blocking element (4).

4. Lock system according to claim 3, wherein the blocking element (4) is constituted by a one-piece-element and the blocking portion (4.1).

5. Lock system according to claim 3, wherein the blocking element (4) is constituted by a one-piece-element comprising a handle portion (4.2) and the blocking portion (4.1).

6. Lock system according to anyone of the preceding claims, wherein the blocking portion (4.1) comprises a tapered free end (4.1.1).

7. Lock system according to anyone of the preceding claims, wherein the free end (4.1.1) of the blocking portion (4.1) is constituted by a wedge-shaped portion comprising a first surface section (4.1.2) facing the outer side of the door (2.1) in the activated tilting position (5a) and a second surface section (4.1.3) arranged on the side turned away from the outer side of the door (2.1) in the activated tilting position (5a), wherein the angle (β) confined by the second surface section (4.1.3) and the outer side of the door (2.1) is greater than the angle (α) confined by the first surface section (4.1.2) and the outer side of the door (2.1).

8. Lock system according to anyone of the preceding claims, wherein the free end (4.1.1) of the blocking portion (4.1) is constituted by a wedge-shaped portion comprising a first surface section (4.1.2) facing the outer side of the door (2.1) in the activated tilting position (5a) and a second surface section (4.1.3) arranged on the side turned away from the outer side of the door (2.1) in the activated tilting position (5a), wherein the angle (β) confined by the second surface section (4.1.3) and the outer side of the door (2.1) is between 45° and 85°, preferably between 50° and 70°, wherein the angle (β) widens upwardly.

9. Lock system according to anyone of the preceding claims, wherein the free end (4.1.1) of the blocking portion (4.1) is constituted by a wedge-shaped portion comprising a first surface section (4.1.2) facing the outer side of the door (2.1) in the activated tilting position (5a) and a second surface section (4.1.3) arranged on the side turned away from the outer side of the door (2.1) in the activated tilting position (5a), wherein the angle (α) confined by the first surface section (4.1.2) and the outer side of the door (2.1) is between 0° and 40°, preferably between 10° and 30°, wherein the angle (α) widens upwardly.

10. Lock system according to anyone of the preceding claims, wherein the blocking element (4) is preloaded to the activated tilting position (5a) by means of a spring (6).

11. Lock system according to anyone of the preceding claims, wherein the longitudinal direction of the blocking portion (4.1) is slanted downwardly in the activated tilting position (5a) of the blocking element (4).

12. Lock system according to claim 10 or 11, wherein the spring force is dimensioned such that tilting of the blocking element (4) by abutting of the door (2) against the second surface section (4.1.3) of the blocking portion (4.1) and lifting up said blocking portion (4.1) by means of the closing force of an automatic close mechanism of the door (2.1) is possible.

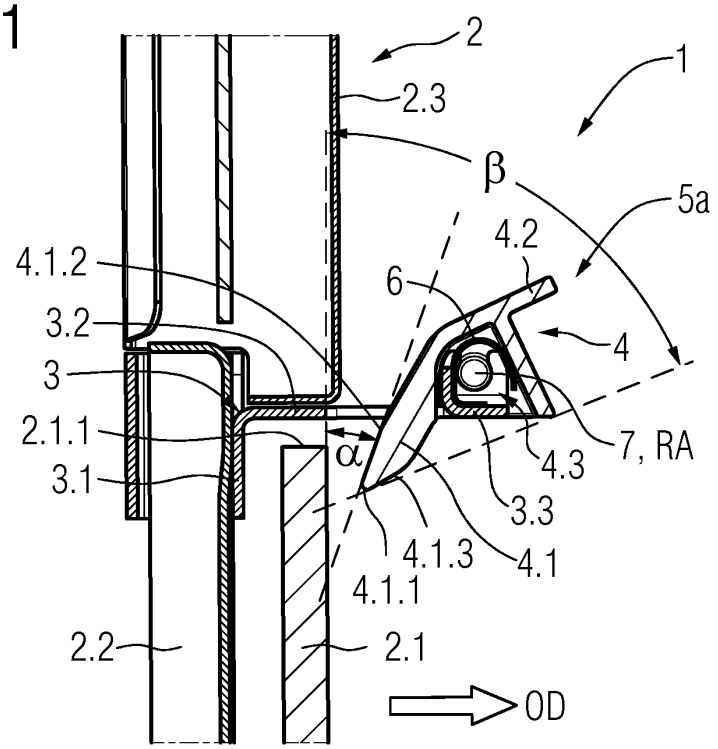
13. Lock system according to anyone of the preceding claims, wherein the lock system is adapted such that the activated tilting position (5a) of the blocking element (4) is reinforced when trying to open the door (2.1) in the activated state of the lock system.

14. Lock system according to anyone of the preceding claims, wherein the fastening element (3) comprises a bracket-like shape.

15. Lock system according to claim 14, wherein the fastening element (3) comprises a first bracket leg (3.1) and a second bracket leg (3.2) wherein the first bracket leg (3.1) is arranged at the chassis of the oven (2) and the free end of the second bracket leg (3.2) is located in front of the door (2) with respect to the opening direction (OD) of the door (2).

16. Oven (2) for preparing food comprising an oven cavity with a cavity opening and at least one door (2.1) adapted to cover the cavity opening, with a lock system (1) for securing the closed state of the door (2.1), wherein the lock system (1) is adapted according to anyone of the preceding claims.

FIG 1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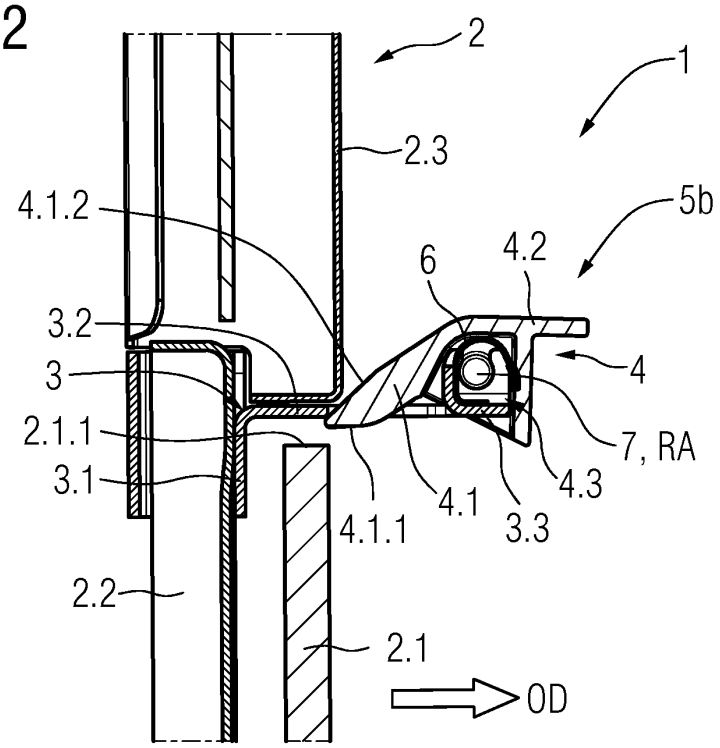
OD

FIG 2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OD

FIG 3

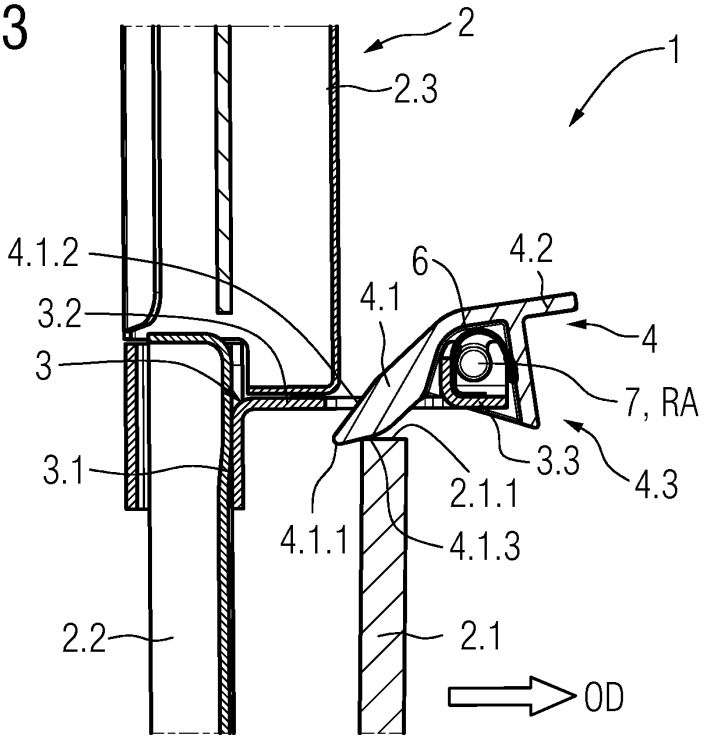


FIG 4

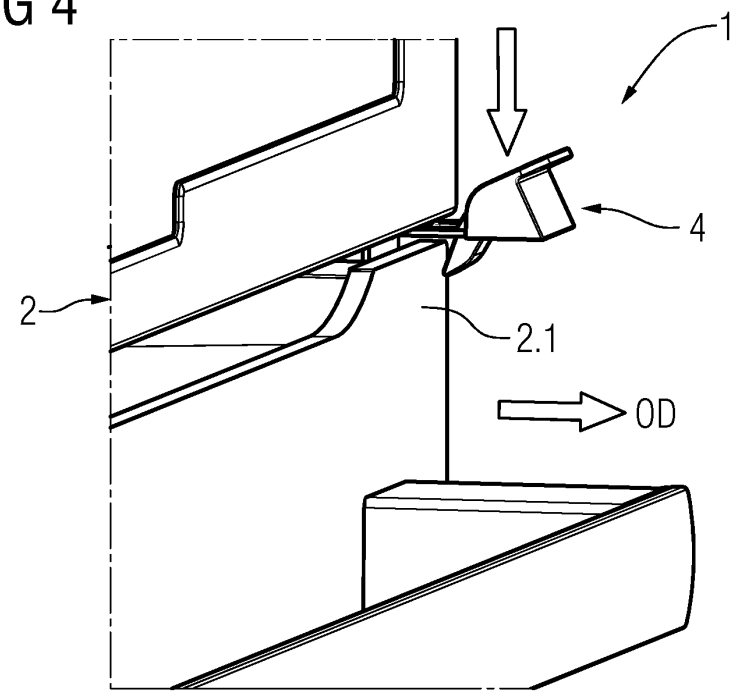


FIG 5

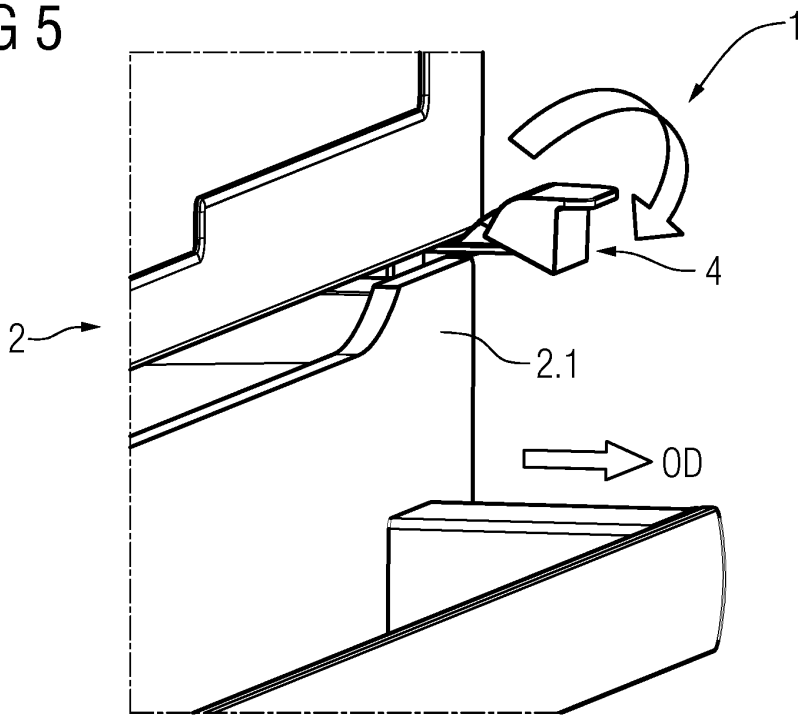
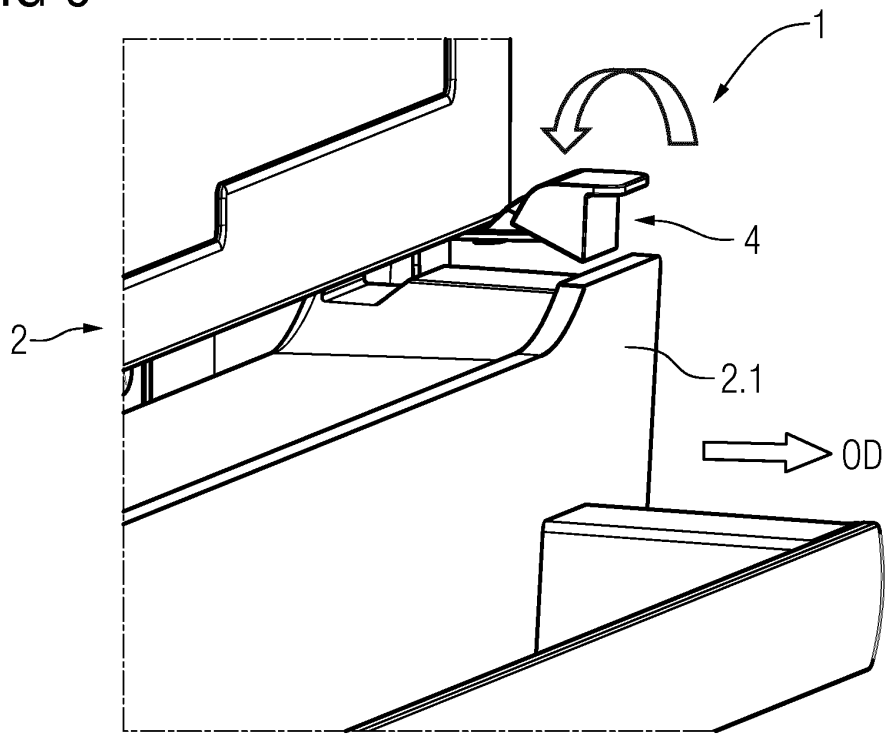


FIG 6



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EUROPEAN SEARCH REPORT

Application Number
EP 13 18 5085

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2011/175374 A1 (HERTRICH GREGORY P [US]) 21 July 2011 (2011-07-21) * paragraphs [0048], [4976]; figures 2a, 2b,3d *	1-3,14, 15	INV. E05B65/00 F24C15/02 E05C3/14
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Place of search	Date of completion of the search	Examiner
The Hague	28 April 2014	Verdoodt, Luk

CATEGORY OF CITED DOCUMENTS

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